

May 29, 1928.

1,671,365

M. R. HATCH

COUNTERBALANCING MECHANISM

Filed Feb. 4, 1927

2 Sheets-Sheet 1

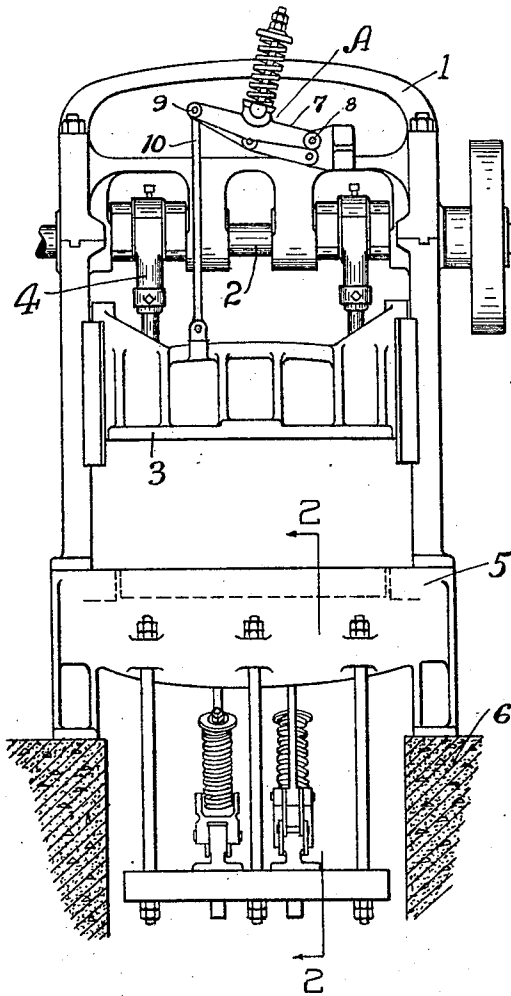


Fig-1

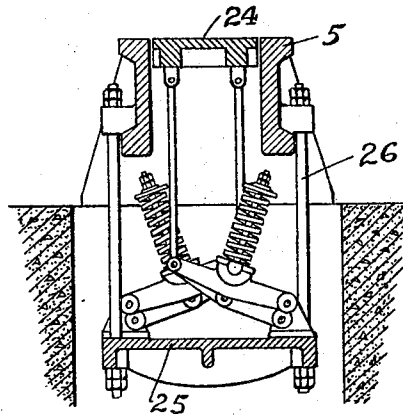


Fig-2

Inventor

Meredith R. Hatch

By

Owen & Owen

Attorneys

May 29, 1928.

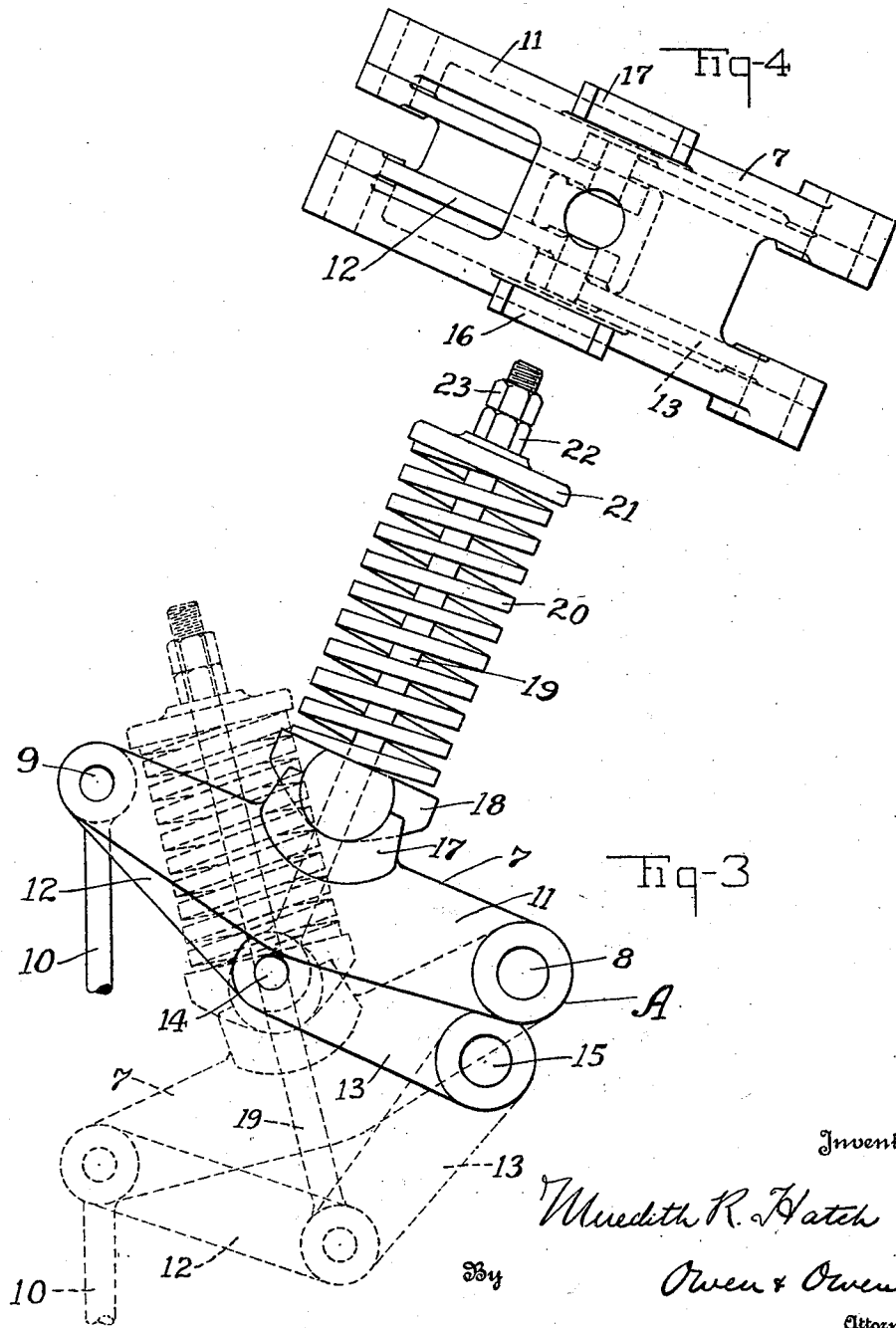
1,671,365

M. R. HATCH

COUNTERBALANCING MECHANISM

Filed Feb. 4, 1927

2 Sheets-Sheet 2



Patented May 29, 1928.

1,671,365

UNITED STATES PATENT OFFICE.

MEREDITH R. HATCH, OF TOLEDO, OHIO, ASSIGNOR TO THE TOLEDO MACHINE & TOOL COMPANY, OF TOLEDO, OHIO, A CORPORATION OF OHIO.

COUNTERBALANCING MECHANISM.

Application filed February 4, 1927. Serial No. 165,825.

This invention relates to sheet metal presses of the type ordinarily referred to as drawing presses, but more particularly to mechanism for yieldingly resisting movements of a member, as for example, yieldingly sustaining the draw-ring or pressure plate so that the metal being drawn is yieldingly supported with sufficient counteracting pressure to prevent the formation of wrinkles and tearing of the metal.

In certain machines, the article to be operated upon is positioned between pressure producing heads, or a pressure producing head and an abutment, drawing presses being outstanding machines of this class. It is not infrequently expedient yieldingly to support a head in such manner that a substantially constant and invariable resistance is offered to the relative movement of the parts. In the case of drawing presses this results in the drawing of metal in an efficient manner without tearing or wrinkling.

It is further desired to counterbalance the vertical reciprocating parts of a press so they will remain in a position of rest and not drop, should the drive shaft be disconnected from the power source. Such mechanism should be constantly connected and not interfere in any material manner with the proper functioning of the machine.

Objects of this invention are to provide a new and improved mechanism which meets the above requirements, is positive in action, and is simple and inexpensive to make and install; to provide an equalizing mechanism of the above character having a minimum number of parts, and effective to offer a substantially constant and invariable yielding resistance to the relative movement of a pair of members; and to provide a device for yieldingly resisting in a substantially uniform manner the relative movement of a pair of members having the features of construction, arrangement and operation hereinafter described.

The invention is shown by way of illustration in the accompanying drawings, in which:

Fig. 1 is an elevational view of a press embodying the invention; Fig. 2 is a transverse sectional view on the line 2—2 of Fig. 1; Fig. 3 is an enlarged side elevation of the counter-balancing device; and Fig. 4 is a

top plan view of the device shown in Fig. 3 with the spring, spring seat and stem removed.

The illustrated embodiment of the invention comprises a press consisting of a frame having a crank shaft 2 for vertically reciprocating a pressure head 3 to which it is connected by connecting rods 4. The bed 5, which supports the frame, is supported by a concrete bed or foundation 6.

In operation the crank shaft 2 is connected to a source of power, and when the power is shut off, the pressure head will drop if it is in raised position, and the crank is slightly over dead center. This is dangerous to operators in changing dies or for other reasons having their hands between the bed plate 5 and pressure head 3.

For holding the pressure head in any desired position, a counter-balancing mechanism A is provided, and as shown in detail in Figs. 3 and 4, this device comprises a lever 7 pivotally connected at one end by a pin 8 to the frame 1. The opposite end of the lever 7 is inclined upwardly and is connected by a pin 9 to a depending rod 10, which is pivoted at its lower end to the pressure head 3. Formed on opposite sides of the lever 7 are flanges 11, and disposed between the flanges 11 is a toggle lever composed of arms 12 and 13, connected together by means of a pin 14. The arms 12 and 13 of the toggle lever are suitably reinforced by ribs and webs in the manner shown on the drawings.

The free end of the arm 12 of the toggle lever is pivotally connected to the pin 9 and is bifurcated to embrace opposite sides of the depending rod 10. In this manner the lever 7 and part 12 of the toggle lever and depending rod 10 have a common pivot or connecting pin 9.

The inner end of the toggle lever or free end of the arm 13 is pivotally connected by a pin 15 to the frame 1 in spaced relation to the pivot pin 8 of the lever 7. As shown in Fig. 3, the pivot pin 15 is disposed below and slightly outward with respect to the pivot pin 8.

Formed on opposite sides of the lever 7 are sockets 16 and 17 to receive a bearing member 18. Extending through an opening in the central part of the bearing 18 is a stem

19, which is pivoted at its lower end to the toggle joint 14. Encircling the stem 19 is a coiled compression spring 20 which seats at one end on the bearing member 18, and the opposite end abuts against a retainer disk 21, which is held in place by a nut 22 screwed on the end of the stem 19, a lock nut 23 holding the nut 22 securely in place. Adjustment of the nut 22 enables the tension of the spring 20 to be adjusted.

Another use of the equalizing mechanism A is shown in the lower part of Fig. 1 and in Fig. 2. In this case the mechanism is employed as a cushion or yielding support for a plate 24 for providing a substantially constant resistance during the major portion of its downward travel produced by movement of pressure head 3 through dies which are customarily attached thereto. The mechanism is constructed in a manner similar to that above described, but the stationary pivots for the spring-supporting lever and toggle lever are on a supporting plate 25 suspended from the bed 5 by rods 26, and the connecting rod extends upwardly instead of downwardly. Instead of a single unit being employed as shown in Fig. 1 for counterbalancing the pressure head 3, a pair of units are used in connection with the plate 24, although it is to be understood that the number employed may be varied according to the demands of service. In both forms the pressure on the free ends of the levers of the mechanism A is in a downward direction.

In the operation of the equalizing mechanism A, it is manifest that with the parts in normal position, the arms of the toggle are substantially aligned, and an effort to move the conjoined ends of the levers downwardly is resisted by the toggle lever due to the angular position of the levers with respect to the movable part and their conjoined relation. It is noted that the angle of the levers with respect to the movable part is other than a right angle. As the conjoined ends of the levers begin to move downward, the forces developed are resolved into two components, one tending to break the toggle joint and the other tending to compress the spring. As the distance between the pin 9 and pivot 15 of the toggle lever decreases and the angle formed by the arms of the toggle lever decreases, the force required further to break the toggle or decrease that angle is decreased. The breaking of the toggle is compensated for by the compression of the coiled spring. The component of force tending to break the toggle joint is initially greater than that tending to compress the spring, but as the angle of the toggle arms decreases, the component tending to compress the spring increases proportionately, the ratio of the increase being substantially equal to the decrease in the toggle. If the arrangement of the levers and the re-

sistance of the spring is properly calculated, the vertically reciprocatory part of the press relatively to the stationary part is resisted yieldingly in a uniform manner throughout the major portion of travel.

It has been shown that the constant resistance to the relative movement of the parts is effective throughout a longer length of travel than any other similar mechanism, of which I am aware. The simplicity of construction and small number of parts are cardinal features of advantage.

While I have described my improved device in more or less detail to comply with the requirements of the statute, it is, nevertheless, desired that this detailed description be considered merely as illustrative and not as limiting, and it is to be understood that changes and modifications may be made by those skilled in this art without departing from the invention as defined in the following claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a press, relatively movable members, and a connection between said members including a spring-resisted toggle and a member connected to one end of the toggle and movable therewith for yieldingly resisting relative movement of said members uniformly throughout the major portion of travel in one direction.

2. In a press, a pair of relatively movable members, and an elastic device for opposing relative movement thereof in one direction including a toggle, spring means opposing the toggle joint, and a mounting for said spring means connected to an end portion of said toggle to effect a substantially uniform resistance during the major portion of movement.

3. In a press, a pair of relatively movable members, and an elastic device for opposing relative movement thereof in one direction including a toggle, a yielding element opposing the toggle joint, and a pivoted mounting for said yielding element connected for movement with said toggle for producing a substantially uniform resistance during the major portion of travel.

4. In a press, a pair of relatively movable members, and a resilient device for yieldingly resisting relative movement thereof in one direction including a toggle, a spring opposing the toggle joint, a lever pivoted to one end of said toggle and constituting a mounting for said spring, whereby breaking of the toggle is compensated for by increased resistance of the spring and substantially uniform resistance during the major portion of travel is produced.

5. In a press, relatively movable parts, and means connecting said parts including a toggle, a spring for yieldingly resisting breaking of said toggle, and a mounting for said

spring movable with said toggle, thereby to secure substantially uniform resistance to the relative movement of said parts in one direction during the major portion of travel.

5 6. In a press, a pair of relatively movable parts, means for opposing with substantially uniform force the movement of said parts, said means including a toggle, spring means acting against the toggle joint, and means
10 coacting with said spring means and movable with said toggle to compensate for the breakage of the toggle.

7. In a press, a pair of relatively movable parts, means for yieldingly opposing movement of said parts in one direction, said
15 means including a toggle, resilient means acting in opposition to the toggle joint, and a lever connected to said toggle at one joint and serving as a support for said spring
20 means, whereby said lever and toggle move conjointly and breakage of said toggle is compensated for by said spring means.

8. In a press, a stationary part, a movable
25 part, and means for counter-balancing said parts including a toggle, a lever joined at one end to said toggle, and spring means

on said lever for opposing movement of the toggle joint.

9. In a press, a stationary part, a movable part, and counter-balancing means for said
30 parts including a lever pivoted to one part, a toggle pivoted to the same part, a common pivot for the opposite ends of said lever and toggle, and a spring on said lever connected to the toggle joint.
35

10. In a press, a pair of relatively movable parts, a resilient device for opposing relative movement thereof in one direction including
40 a toggle, a lever pivoted at one end in spaced relation to the adjacent pivot of said toggle, a common pivot for the outer end of said toggle and lever, a compression spring on
45 said lever, and a stem connecting said spring with the toggle joint.

11. A device for opposing relative movement between members in one direction comprising a toggle, a lever pivoted at its outer
50 end to said toggle, and a spring on said lever opposing the toggle joint.

In testimony whereof I have hereunto
50 signed my name to this specification.

MEREDITH R. HATCH.